

Mapping Multi-scale Energy Flow with Ultrafast Optical Microscopy

Libai Huang

Radiation Laboratory, University of Notre Dame

Novel nanoscale materials with unique physical properties are highly promising for applications in the next generation of solar energy conversion devices. The frontier in solar energy conversion utilizing nanoscale materials now lies in learning how to integrate functional entities across multiple length scales to create optimal devices. To address this new frontier, I will discuss our recent efforts to resolve multi-scale energy transfer, migration, and dissipation processes with simultaneous femtosecond temporal resolution and nanometer spatial resolution. My talk will focus on the following examples representing different length scales and levels of complexity: (i) energy relaxation in individual nanostructures including graphene and carbon nanotubes; (ii) morphology dependent charge dynamics in organic solar cells; and (iii) correlating structure to functions in photosynthetic systems.